Right Bundle Branch Block (RBBB)

Ed Burns and Robert Buttner • Oct 8, 2024

ECG Diagnostic criteria

- QRS duration > 120ms
- RSR′ pattern in V1-3 (“M-shaped” QRS complex)
- Wide, slurred S wave in lateral leads (I, aVL, V5-6)

RBBB: Right Bundle Branch Block
V1: RSR′ pattern in V1, with (appropriate) discordant T wave changes
V6: Widened, slurred S wave in V6

Associated features include:

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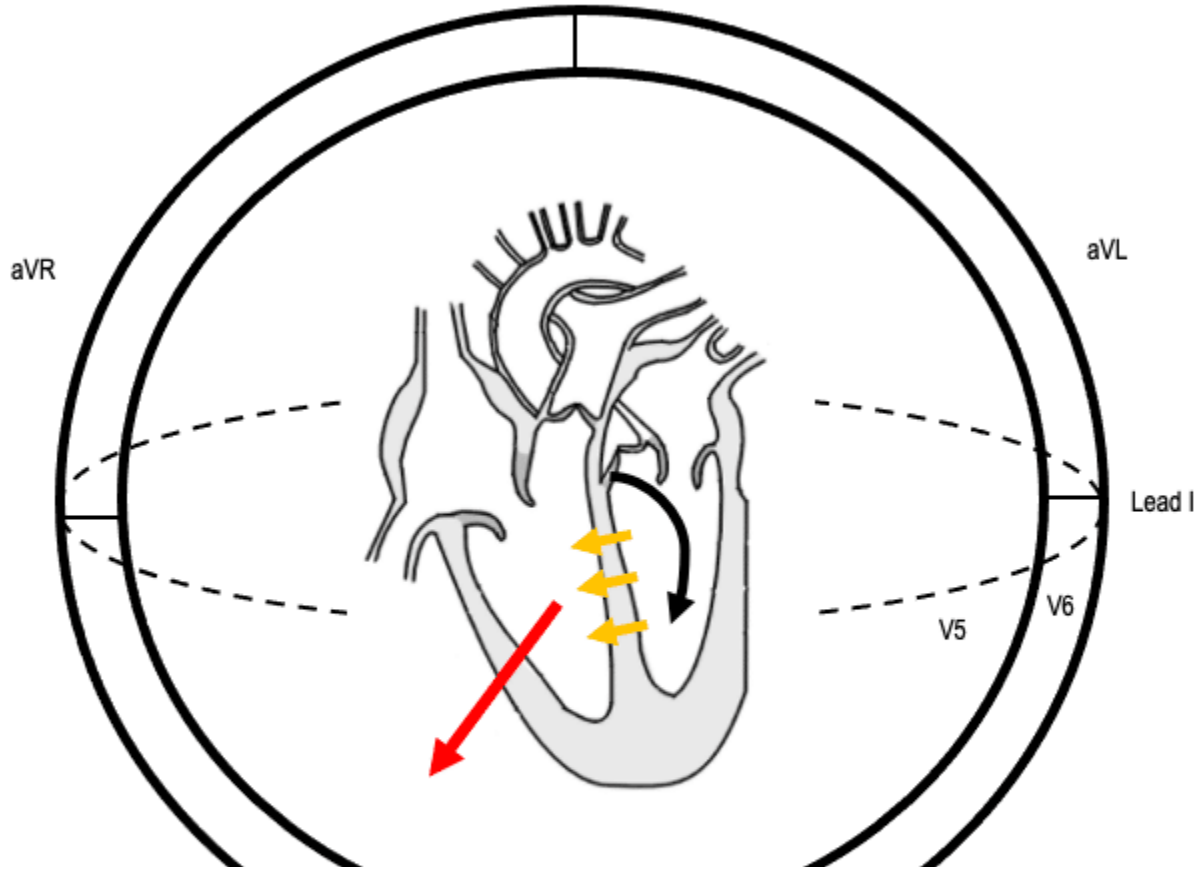
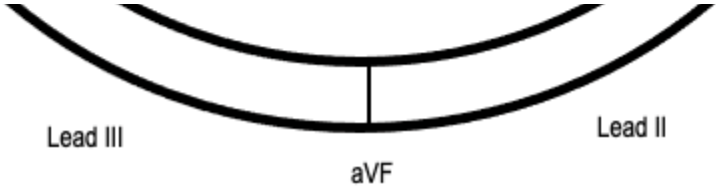
- *Appropriate discordance* with ST depression and/or T-wave inversion in right precordial leads (V1-3).

Electrophysiology

In normal cardiac conduction, impulses travel equally down the left and right bundles, with the septum activated from left to right and the formation of small Q waves in lateral leads

- In RBBB, the left ventricle is activated normally, thus the early part of the QRS complex correlating to septal depolarisation is unchanged
- There is delayed activation of the right ventricle as depolarisation originates from the left ventricle across the septum. This produces a secondary R wave (R′) in the precordial leads, and a wide, slurred S wave in lateral leads
- Normal activation of the left ventricle means that cardiac axis remains normal in isolated RBBB





Sequence of conduction in RBBB:

1) Left ventricular activation via the left bundle (black arrow) occurs normally

2) Septal depolarisation (yellow arrows) is thus unaffected, producing a normal early QRS complex

3) Activation of the RV originates across the septum. The resultant depolarisation vector (red arrow) produces delayed R waves in leads V1-3, and S waves in lateral leads

ECG QRS Morphology

QRS Morphology in V1

Sometimes rather than an RSR′ pattern in V1, there may be a broad monophasic R wave or a qR complex.

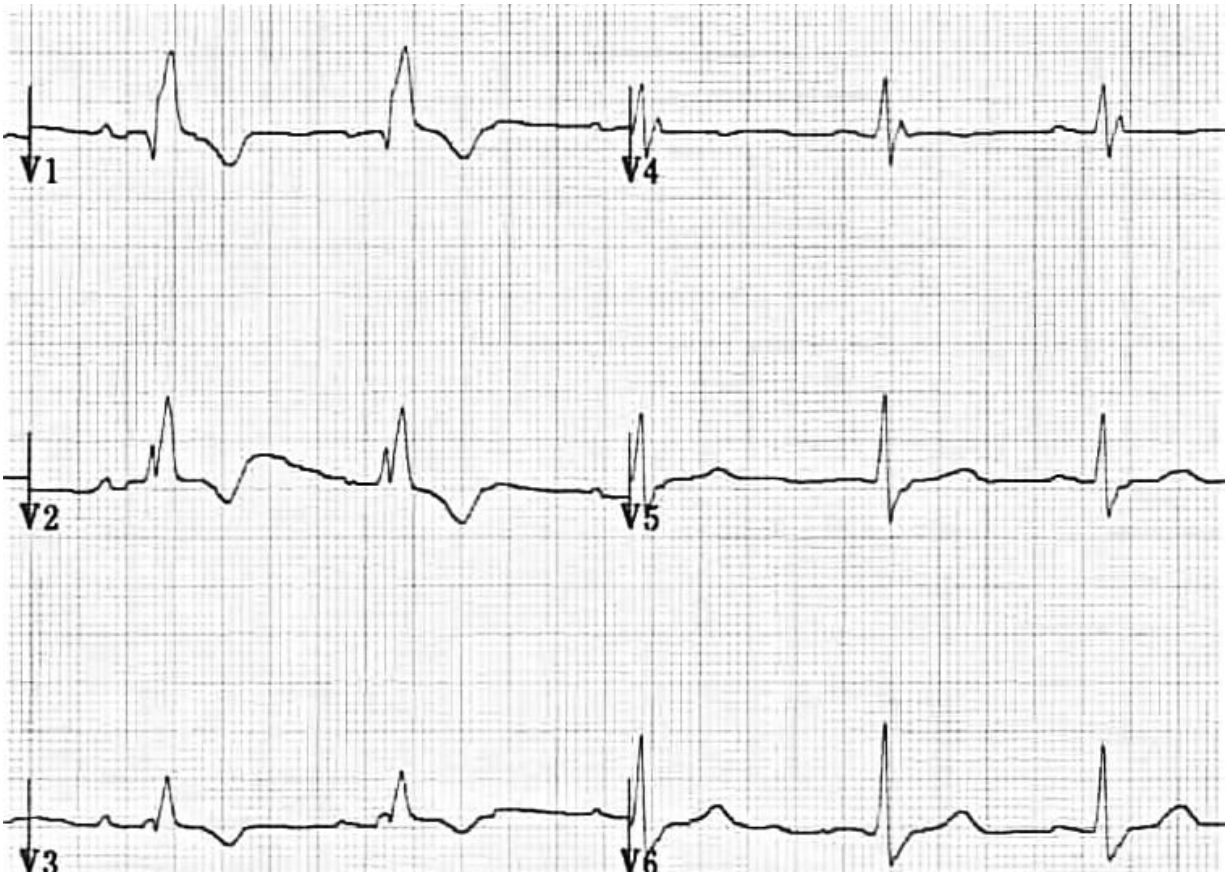
Typical RSR′ pattern (‘M’-shaped QRS) in V1

QRS Morphology in Lateral Leads

Wide slurred S wave in lead I

Appropriate discordance

- *Appropriate discordance* refers to the fact that abnormal depolarisation should be followed by abnormal repolarisation, which appears discordant to the preceding QRS complex
- In RBBB, this manifests as ST depression and/or T-wave inversion in leads V1-3



Appropriate discordance: Typical pattern of T-wave inversion in V1-3 with RBBB

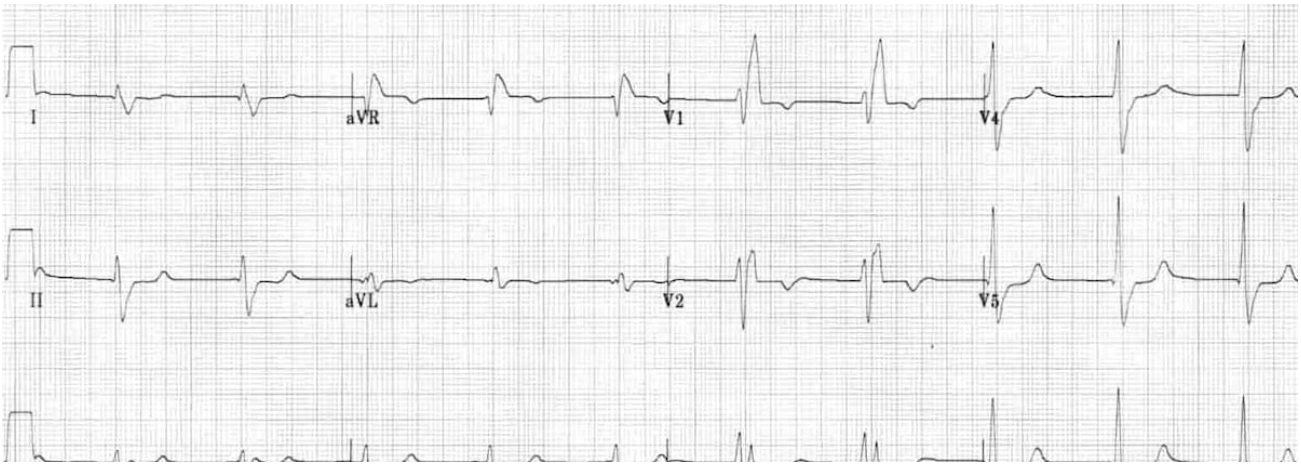
Causes of Right Bundle Branch Block

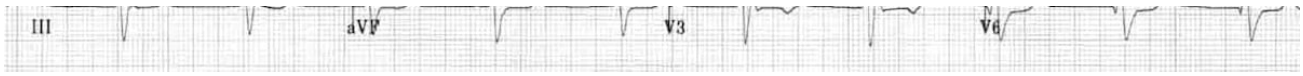
- Right ventricular hypertrophy / cor pulmonale
- Pulmonary embolus
- Ischaemic heart disease
- Rheumatic heart disease
- Congenital heart disease (e.g. atrial septal defect)
- Myocarditis
- Cardiomyopathy
- Lenègre-Lev disease: primary degenerative disease (fibrosis) of the conducting system

There is increasing literature suggesting that in the context of chest pain, a new RBBB is highly concerning for OMI and a potential indication for immediate reperfusion therapy. The right bundle branch is supplied by LAD perforators in most patient populations and thus occlusion of this branch may manifest as a new RBBB +/- LAFB.

ECG Examples of Right Bundle Branch Block

Example 1

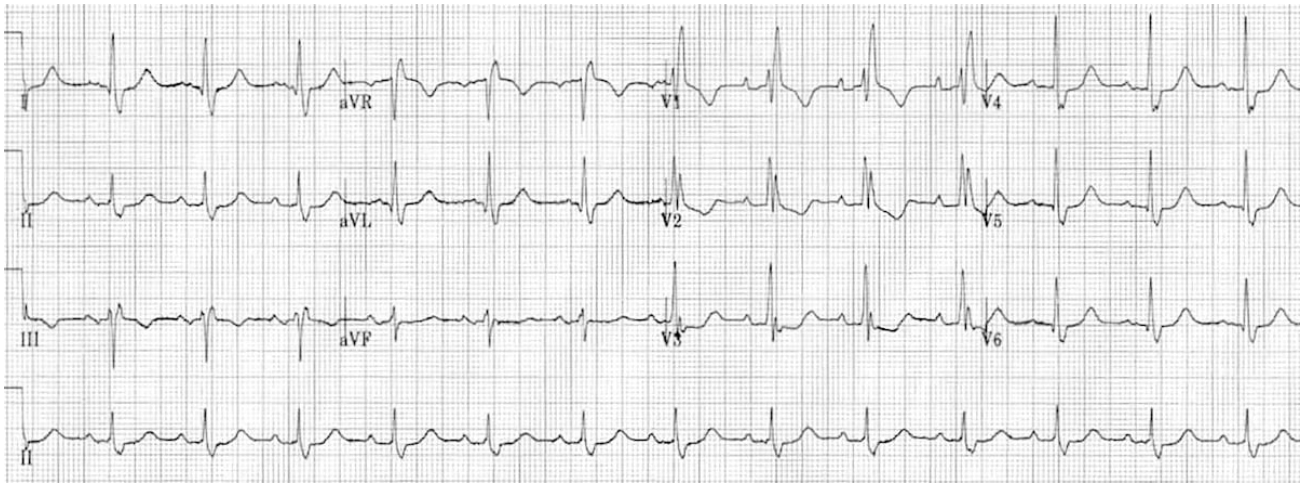




RBBB with LAFB.

- Broad QRS > 120ms
- Note the prominent delayed RV conduction, manifested as a tall, broad R wave (R′) best seen in lead V1
- Widened S wave is best appreciated in lead I
- There is appropriate discordance in the right precordial leads with T-wave inversion

Example 2



Isolated RBBB.

- Typical RSR′ pattern in V1-2
- Widened S waves again demonstrated in lateral leads, especially V4-6
- Appropriate discordance in leads V1-2

Example 3

Isolated RBBB.

- RSR′ pattern in V1-3
- Lateral S wave changed are not evident here
- Note note normal axis in isolated RBBB

Example 4

RBBB with LAFB in the context of chest pain.

- RBBB is seen with RSR′ pattern in V1-3 and slurred S waves in lateral leads
- There is concordant ST segment changes best seen in V2, and hyper-acute T waves inferiorly. This patient was found to have a 99% proximal LAD occlusion. See OMI:

Replacing the STEMI misnomer for further case details

Incomplete RBBB

- Incomplete RBBB is defined as an RSR′ pattern in V1-3 with QRS duration < 120ms.
- It is a normal variant, commonly seen in children (of no clinical significance).

Differential Diagnosis of RBBB

- An RSR′ pattern in V1-3 may also be caused by Brugada syndrome — an ECG pattern associated with malignant ventricular arrhythmias.

Related Topics

- Left bundle branch block LBBB
- Right Bundle Branch Block RBBB
- Left anterior fascicular block LAFB
- Left posterior fascicular block LPFB
- Interventricular Conduction Delay IVCD
- Bifascicular block
- Trifascicular block
- Complete Heart block CHB
- OMI: Replacing the STEMI misnomer

Further reading

- Butterly S, Larsen P. Right Bundle Branch Block. HeartHQ
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Advanced Reading

Online

- Wiesbauer F, Kühn P. ECG Mastery: **Yellow Belt** online course. Understand ECG basics. Medmastery
- Wiesbauer F, Kühn P. ECG Mastery: **Blue Belt** online course: Become an ECG expert. Medmastery

- Kühn P, Houghton A. ECG Mastery: **Black Belt** Workshop. Advanced ECG interpretation. Medmastery
- Rawshani A. Clinical ECG Interpretation ECG Waves
- Smith SW. Dr Smith's ECG blog.
- Wiesbauer F. Little Black Book of ECG Secrets. Medmastery PDF

Textbooks

- Zimmerman FH. ECG Core Curriculum. 2023
- Mattu A, Berberian J, Brady WJ. Emergency ECGs: Case-Based Review and Interpretations, 2022
- Straus DG, Schocken DD. Marriott's Practical Electrocardiography 13e, 2021
- Brady WJ, Lipinski MJ et al. Electrocardiogram in Clinical Medicine. 1e, 2020
- Mattu A, Tabas JA, Brady WJ. Electrocardiography in Emergency, Acute, and Critical Care. 2e, 2019
- Hampton J, Adlam D. The ECG Made Practical 7e, 2019
- Kühn P, Lang C, Wiesbauer F. ECG Mastery: The Simplest Way to Learn the ECG. 2015
- Grauer K. ECG Pocket Brain (Expanded) 6e, 2014
- Surawicz B, Knilans T. Chou's Electrocardiography in Clinical Practice: Adult and Pediatric 6e, 2008
- Chan TC. ECG in Emergency Medicine and Acute Care 1e, 2004

LITFL Further Reading

- ECG Library Basics – Waves, Intervals, Segments and Clinical Interpretation
- ECG A to Z by diagnosis – ECG interpretation in clinical context
- ECG Exigency and Cardiovascular Curveball – ECG Clinical Cases
- 100 ECG Quiz – Self-assessment tool for examination practice
- ECG Reference SITES and BOOKS – the best of the rest